STUDY GUIDE FOR DEMONSTRATION, CONSULTATION AND RESEARCH PEST CONTROL

The educational material in this study guide is practical information to prepare you to meet the written test requirements. It doesn't include all the things you need to know about this pest-control subject or your pest-control profession. It will, however, help you prepare for your test.

Contributors include the Utah Department of Agriculture and Food and Utah State University Extension Service. This study guide is based on a similar one published by the Colorado Department of Agriculture. Materials for that guide were prepared by Colorado State Extension Service. Other contributors include: University Extension Service personnel of California, Kansas, Nebraska and Wyoming. The U.S. Department of Agriculture and U.S. Environmental Protection Agency, Region VIII Office.

The information and recommendations in this study guide are based on data believed to be correct. However, no endorsement, guarantee or warranty of any kind, expressed or implied, is made with respect to the information contained herein.

Additional topics that may be covered in your examinations include First Aid, Personal Protective Equipment (PPE), Protecting the Environment, Pesticide Movement, Groundwater, Endangered Species, Application Methods and Equipment, Equipment Calibration, Insecticide Use, Application, Area Measurements, and Weights and Measures. Information on these topics can be found in the following books:

1. *Applying Pesticides Correctly: A Guide for Private and Commercial Applicators.* U.S. EPA, USDA and Extension Service, revised 1991.

2. *Applying Pesticides Correctly: A Supplemental Guide for Private Applicators.* U.S. EPA, USDA and Extension Service, December 1993, Publication E-2474.

These books can be obtained from the Utah Department of Agriculture and Food or Utah State University Extension Service. Please contact your local Utah Department of Agriculture and Food field representative or Utah State University extension agent.

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INTRODUCTION

Persons conducting pesticide field research and/or use demonstrations with restricted-use pesticide products are, by virtue of their prominence and visible role, key sources of important information.

Their pesticide handling and use practices are the examples often followed by the public and other applicators.

Therefore, they must be especially knowledgeable of safe pesticide use and alternative methods of pest control, understand pesticide-organism interactions, and recognize the importance of supplementing pesticide uses with other practical control measures in an effective integrated pest- management strategy.

For example, cultivation often is needed to maximize the benefits of herbicides. Using pheromone monitoring traps can provide information on the best time to apply a pesticide treatment and possibly reduce the number of applications normally applied. This would decrease the potential environmental concerns and operating costs. We could have used many other good examples.

PREFACE

This pesticide application- and safety-training study guide is intended to provide some of the basic information that commercial applicators of restricted-use pesticides need to meet the minimum federal and state standards for certification and re-certification in the research and demonstration pest-control category.

These standards are set by the U.S. Environmental Protection Agency (EPA) in line with the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), as amended.

People included in the research and demonstration pest-control category are:

1. Those who demonstrate to the public the proper use and techniques of applying restricted-use pesticides or supervise such demonstrations.
2. Those who conduct field research with pesticides and, in doing so, use or supervise the use of restricted-use pesticides.

The first group includes Extension Service specialists and county agents, vocational agriculture instructors, state college and university instructors, industry representatives who demonstrate pesticide products, and others who demonstrate methods used in public programs.

The second group includes state, federal, university, commercial, or industrial research scientists and other persons conducting field research using restricted-use pesticides.

Excluded from these regulatory requirements are persons conducting controlled laboratory-type research involving restricted-use pesticides and doctors of medicine and veterinary medicine applying pesticides as drugs or medication during the course of their normal practice.

People applying for certification in the research and demonstration pest-control category will be responsible for the information contained in the *Applying Pesticides Correctly Study Guide* and the *Applying Pesticides Correctly Supplemental Guide*, as well as the information in this study guide.

All of this information will help individuals to become more responsible pesticide applicators, but it shouldn't be considered all the training necessary to become a research and demonstration pest-control expert.

Testing for certification is given by the Utah Department of Agriculture and Food, Plant Industry Division.

PESTICIDES IN PERSPECTIVE

Man depends on living things to provide the food, fiber and timber he needs for his survival. Destructive pests often make the efficient production of these necessities very difficult, while other organisms constitute a threat to man's health and comfort. There's an obvious need to keep these pests under control, provided it can be done

without serious hazard to man and desirable forms of plant and animal life. In undertaking an objective evaluation of the problem, there's first a need for a general understanding of what is meant by the word "pest."

From a human standpoint, not all plants and animals are beneficial. They may appear in unwanted places, or their numbers may be too great. A weed, for example, has been defined as a plant that is growing where it isn't wanted. In this context, a corn plant in a lawn is a weed, and a rose in a cornfield is a weed. Some animals have been domesticated and provide us with food and fiber; others furnish recreation through hunting or fishing; still others are destructive or carry diseases.

There are birds that eat destructive insects or provide aesthetic enjoyment and are accordingly beneficial; certain other birds are generally regarded as public nuisances. Although there are insects that destroy crops or transmit diseases, many are pollinators or serve as parasites or predators of undesirable insects; still others have aesthetic values, such as butterflies. By and large, those species of plants or animals that conflict with the immediate or long-range needs and desires of man may be regarded as pests.

To control pests, chemical pesticides are widely used. In their use, the objective is to follow methods of application that will accomplish the desired effects with a maximum of safety to man and to forms of life useful to him. At times, however, doubt has been expressed that certain effective pest-control measures have provided a reasonable margin of safety to beneficial organisms. Conflicts of opinion on this score have increased in recent years as a great selection of newly discovered pest-control chemicals have been put to use on an increasingly wide scale to protect man and those plants and animals essential to his welfare.

To add to the difficulty, there's a lack of general agreement as to the relative value of certain animal and plant species, and as to the importance of pest depredations. This constitutes a major conflict of interest. For example, those who enjoy birds may be distressed by any pest-control measures that result in damage to birds and to their food supply or habitat. On the other hand, people most concerned with preserving shade trees may favor use of every means, including application of insecticides that may at times kill some birds, in an effort to control insects that threaten the survival of trees.

Where a conflict of interest occurs relative to the use of a pesticide, the decision rests on the weighing of advantages versus the disadvantages, always considering the general public's good. Such differences in opinion point up the need for objective evaluation. No one wants to choose between trees and birds, though occasionally the choice may have to be made. Preferably, both are wanted.

There's a broad interest in the problem among all biologists, be they entomologists, botanists, ecologists, physicians, or those concerned primarily with wildlife. They all work with living organisms, desirable or undesirable from the standpoint of man's welfare, convenience or economy.

Today we have a complex system of agricultural production and marketing, competition with foreign countries, and high quality standards demanded by the general public, processors, and governmental agencies. Using pesticides often means the difference between profit and loss. Thus, the use of pesticides has become almost indispensable to modern agriculture and, indeed, to the consumer of agricultural products.

Nevertheless, concern for the quality of our environment has added considerable stimulus to the development of pest-control techniques that will reduce the need for pesticides. The challenge is to accomplish this without lowering yields or standards of quality appreciably. This has been accomplished in a few instances, and there's reason to believe that further progress will be made.

However, there's no indication that we'll eliminate the need for pesticides entirely, and it's likely that they'll remain our first line of defense against various types of pests for some time to come. Therefore, it's important that we continue to learn as much as possible about the side-effects of pesticides in the environment so we can use them intelligently, without serious harm to our health and surroundings.

There's broad public interest in environmental issues, representing individuals from all walks of life. Many of

these people support their favorite environmental advocate group.

The result is that there are numerous well-funded, well-intentioned, and -- for the most part -- well-informed environmental-protection organizations with clout.

Because of the increase in population, individual well-being, and leisure time, the number of people interested in the conservation of our environment is increasing steadily.

All persons dependent on the continued practical use of pesticides would be wise to take heed and use the products, when actually needed, in strict compliance with all labels and labeling.

PESTICIDES AND ORGANISMS

INTERACTIONS

Both the beneficial and harmful effects of pesticides are determined by how pesticides and organisms react to each other.

To do its job, a pesticide usually must penetrate the organism, move or be transported to the site of action, and there disrupt or alter a vital function of the pest. The manner in which the pesticide affects the vital function is called its mode of action. Penetration, transport, and mode of action involve pesticide-organism interactions.

Interactions also are involved in the metabolism, accumulation and elimination of pesticides by the organism, as well as in the biodegradation and biological magnification of pesticides. In addition, selectivity (the ability of a pesticide to kill or otherwise alter one organism and not another) and the development of pesticide resistance often are caused by differences in pesticide-organism interaction.

In reviewing the history of pesticides and their environmental impact, one can't avoid using as examples such outdated (in the U.S.) products as DDT. DDT and other persistent chlorinated hydrocarbons formed the basis for much of today's public awareness and legislative action that currently control our uses of pesticides.

PESTICIDE DISTRIBUTION

Pesticides are monitored in the environment mostly by the U.S. Environmental Protection Agency (EPA). This agency has taken over the monitoring functions of several other federal agencies, including the Food and Drug Administration; the National Air-Pollution-Control Administration; the Environmental Control Administration in the Department of Health, Education and Welfare; the Federal Water-Pollution-Control Administration; the U.S. Department of Agriculture; the Department of the Interior; and the U.S. Public Health Service. The monitoring program includes fish, shellfish, wildlife, water, soil, food and humans. In addition to the federal program, considerable monitoring is also done by state agencies, scientists from universities, and the chemical industry.

Examination of the literature on monitoring indicates that only a limited number of pesticides are generally found in environmental samples such as soil, water, air and wildlife. However, articles written about pesticides in the environment often generalize about their occurrence, giving the false impression that all pesticides are involved. Careful reading of these articles will usually reveal that they are based entirely on studies involving DDT or another of the more persistent chlorinated-hydrocarbon insecticides. The only samples that commonly contain other types of pesticides are food crops that have been deliberately treated with these materials. These generally occur at levels below tolerance limits set by EPA.

Results of monitoring studies must be interpreted carefully, especially when dealing with amounts of pesticides in the parts-per-billion or parts-per-trillion range. The use of gas liquid chromatography has made possible the detection of extremely small amounts of some chemicals. However, identification of these chemicals is by no means certain unless confirmatory techniques are employed. This may be very hard and perhaps impossible at such low levels unless large samples are used. Also, at these levels it may not be possible to rule out accidental contamination of the

sample, either at the time of collection, during storage, or in the analytical process.

The importance of confirming the identity of pesticides was illustrated recently when two chlorinated-hydrocarbon insecticides, dieldrin and heptachlor, were apparently discovered in soil that had been collected and sealed in jars between 1909 and 1911, long before these chemicals had even been synthesized. Efforts to confirm the identity of these chemicals proved they were not pesticides but apparently naturally occurring constituents of the soil.

There's also evidence that polychlorinated biphenyls (PCBs) have been erroneously reported as DDT in environmental samples. Apparently PCBs, which are used in a variety of products ranging from plastics to industrial coolants, are widespread in the environment and can easily be mistaken for DDT if proper techniques aren't used.

PESTICIDES IN WATER

Pesticides may enter water in several ways, including fallout from the atmosphere, drift from nearby applications, and movement from treated land by means of dust particles or runoff water. They may also be applied directly to water, either purposely or accidentally. Although quantitative information on the importance of these sources of contamination is limited, it seems likely that treated soil is the principal factor involved. Most pesticides are not readily soluble in water but are often bound tightly to soil particles or organic matter in the soil. These particles can then move long distances by wind and water, so it isn't surprising that pesticides are sometimes found far removed from the site of application.

Although agricultural lands undoubtedly contribute to the contamination of water with pesticides, some of this pollution comes from urban areas, where pesticides are used in the home and garden. Some of the contamination of the Great Lakes with DDT has been traced to city sewers. Pesticide contamination in the Red Cedar River in Michigan is reported to come mostly from waste-water treatment plants, even though the river runs through areas of extensive agricultural development.

The pesticides most often found in water are some of the chlorinated-hydrocarbon insecticides including dieldrin, endrin, heptachlor, lindane, BHC and chlordane.

PESTICIDES IN SOIL

Soils are important in determining what happens to a pesticide after application. Even though some pesticide volatilizes before reaching the soil or is intercepted by plants, a large portion may eventually reach the soil. As previously discussed, soil can serve as a reservoir from which pesticides may move to other areas by water or wind erosion. Pesticides may also escape by evaporation from the soil surface into the atmosphere. Soil organisms may serve to transport pesticides from one area to another, usually because they serve as a food source for animals or birds.

Of at least equal or greater importance is the fact that soils and the organisms they contain are largely responsible for the breakdown or inactivation of pesticides. This capability varies with soil type and climate, factors that often determine whether a particular pesticide should be used in a given area. Aside from purely environmental concerns, a pesticide that persists too long in soil may also damage the farmer's crop.

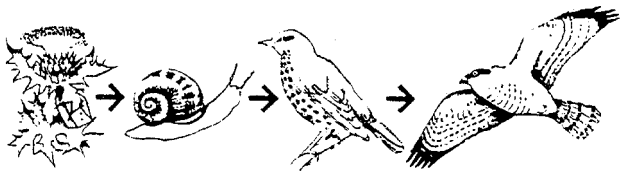
Most pesticides don't move readily in soil because they are bound to soil particles, especially clay and organic matter. Consequently, they are usually found in the top few inches of soil. In rare instances, some have been found at depths of several feet.

PESTICIDES IN WILDLIFE

It isn't surprising to learn that pesticides found in wildlife are in general the same ones found in soil and water. Their food is derived directly or indirectly from soil and water, and in some instances, pesticides will accumulate in wildlife at concentrations ranging up to thousands of times that in soil and water. This is the process previously described as biomagnification. As far as is known, this occurs only with persistent chemicals that are readily soluble in fat. One of the best examples is DDT.

Dieldrin and heptachlor have also been implicated in biomagnification, but other chlorinated-hydrocarbon insecticides have not. Some of the highest residues of

the chlorinated-hydrocarbon insecticides have been found in birds of prey such as hawks and eagles. Fish-eating birds are especially likely to contain residues of these insecticides. As might be expected, the insecticides most commonly found are DDT and dieldrin. These chemicals have been associated with lowered reproduction in several species of these birds. In fact, this is the principal reason that the use of DDT and dieldrin has been severely restricted in the United States and other countries of the world.



The presence of pesticides in seed-eating birds is generally much less than in birds of prey, and to date, there's little reason to believe there has been any effect on their reproduction. Birds have been killed by direct application of pesticides and by eating food contaminated with pesticides. This isn't a general occurrence and, so far as is known, hasn't caused population declines that would threaten the existence of a species of seed-eating bird.

PESTICIDES IN FOOD

Pesticides in food are monitored and controlled by two federal agencies, the Food and Drug Administration (FDA) and the Environmental Protection Agency (EPA). Some state agencies are also involved in these activities.

EPA has the responsibility of establishing tolerances for pesticides in food. It also monitors pesticides in foods that are prepared for the table. This is commonly referred to as a "market-basket" or "total-diet study."

FDA determines the amount of pesticides on foods shipped in interstate commerce. It has authority to seize shipments that contain pesticide residues above tolerance and to initiate legal proceedings against the shipper.

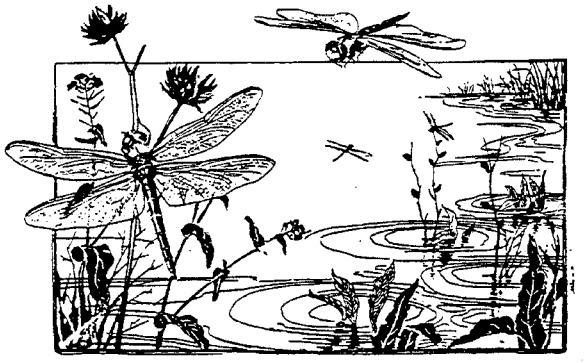
FDA examines foods for contaminants other than pesticides, including such things as rodent hairs, fecal pellets, and insect parts. Tolerances are established for these contaminants in food as well as pesticides. While consumers might be surprised to learn that a certain number of fecal pellets or insect legs are permitted in foods, perhaps they can take some comfort in knowing that current standards are much stricter than they were 20 or 30 years ago. Pesticides have been largely responsible for these strict standards, and ironically, these standards are now a serious obstacle to the reduction of pesticide usage in certain situations. To the farmer, the use of pesticides may mean much more than simply increasing yield. If the quality of his crop is lowered by pest damage, he may not be able to market it at any price.

Every year, FDA determines the amount of pesticide chemicals in processed and raw agricultural products that are shipped interstate. This is a surveillance and regulatory program designed for the enforcement of tolerances set by EPA. Samples are collected throughout the year at producing, shipping and destination points.

ENVIRONMENTAL CONCERNS

As we learn more about the behavior of pesticides in the environment, we find it necessary to devise more sensitive and discerning techniques to determine what their total impact will be. Invariably, man's innovations begin without a complete understanding of their consequences, such as the development of cars, airplanes, and the atomic bomb. Pesticides are no exception. The best we can do is to use all available knowledge, make allowances for unknown factors, and carefully estimate benefits and risks.

We'll probably never be able to prove that any pesticide can be used without risk; proving a negative is generally impossible. But past experience and current EPA testing requirements give considerable assurance that risks will be minimal. During the past ten years, the time required to meet federal testing requirements has nearly doubled. There has also been a notable reduction in the appearance of new pesticides on the market and increased emphasis on finding ways to reduce the need for these chemicals.



The concern about effects of pesticides on the environment is an extremely controversial issue debated by scientists, politicians, and the general public. One of the main reasons for this is that it's very hard to prove that a chemical is or isn't harmful, especially when it's present in small amounts and its effects can't be clearly demonstrated outside the laboratory.

PESTICIDE LAWS AND REGULATIONS

Laws governing the use and the users of pesticides are designed to protect man and the environment.

One such law, the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) of 1947, originally was primarily a labeling law administered by the USDA. It has been amended several times, however, and has become a powerful agent for protection from abuse of pesticide use. It's now administered by the EPA.

FIFRA and the Utah Pesticide Control Act, Chapter 14, are the principal statutes governing the commercial distribution, use and application of pesticides in Utah. The following information presents some selected provisions of FIFRA and is intended solely for general information.

FIFRA

The intent of FIFRA is to protect both man and the environment. It seeks to insure this protection by providing for the controlled use of pesticides. The law contains provisions on pesticide registration, classification, labeling, distribution, use, and other topics. Those sections pertaining to pesticide users broadly address three key issues: user categories, certification, and penalties for violations. Penalties for violations of FIFRA will be discussed in a following section, Pesticide-Use Liability.

User Categories -- FIFRA recognizes two pesticide-user categories -- private and commercial applicators. A private applicator is defined as being a certified applicator who uses or supervises the use of a restricted-use pesticide to produce an agricultural commodity on property he/she owns or rents, on an employer's property, or on the property of another person (if there's no compensation other than trading personal services.) A commercial applicator is any person who uses or supervises the use of restricted-use pesticides for any purpose other than producing an agricultural commodity. Utah recognizes an additional category, the non-commercial applicator. A non-commercial applicator is any person working as an individual or an employee of a firm or government agency who uses or demonstrates the use of any pesticide classified for restricted use and who neither qualifies as a private applicator nor requires a commercial applicator's license.

FIFRA recognizes two classes of pesticides -- general-use and restricted-use. Some pesticides can be registered for both general and restricted use. Classifying a pesticide "for restricted use" by regulation is also authorized.

Two points about these definitions are especially important. First, in order to use or supervise the use of restricted-use pesticides, a person must be certified. Secondly, supervising use is construed to mean that the certified applicator need not be physically present during the application procedure but "is available if and when needed."

FIFRA clearly states that using a pesticide in a manner inconsistent with its labeling is unlawful. Some procedures are specifically exempted under this provision and they include:

1. "Applying a pesticide at any dosage, concentration or frequency less than that specified on the labeling."

2. Applying a pesticide against any pest occurring on any crop, animal or site specified on the labeling unless use of the pesticide is restricted only to those pests specified on the labeling.
3. Using "any method of application not prohibited by the labeling."
4. Mixing one or more pesticides with fertilizer if not prohibited by the labeling.

RECORD-KEEPING FOR PRIVATE APPLICATORS

As of May 10, 1993, certified private applicators must maintain record(s) of federally restricted-use pesticide applications. The record(s) must be maintained for two years following the pesticide application. In addition, effective August 1995, the record information must have been recorded no later than 14 days following the pesticide application. The records must contain:

1. The brand or product name of the federally restricted-use pesticide and the product's EPA registration number.
2. The total amount applied.
3. The size of the area treated.
4. The crop, commodity, stored product or site.
5. The location of the application.
6. The month, day and year of the application
7. The certified applicator's name and certification number.

A certified applicator who violates any provision of the regulation will, for the first offense, be subject to a fine of not more than $500. For later offenses, he or she will be subject to a fine of not less than $1,000 for each violation.

Commercial applicators shall keep and maintain records of each application of any pesticide to include the following information:

1. Name and address of owner of property treated.
2. Location of treatment site, if different from (1).
3. Date of application.
4. Name of pesticide, formulation, concentration, rate applied, and total amount used.
5. Purpose of application.

Such records shall be kept for a period of two years from the date of application of the pesticide and shall be available for inspection by the Utah commissioner of agriculture at reasonable times. The commissioner shall be furnished a copy of such records by the commercial applicator.

Non-commercial applicators shall keep and maintain records of each application of restricted-use pesticides to include the following information:

1. Name and address of owner.
2. Location of treatment site, if different from (1).
3. Date of application.
4. Name of pesticide, formulation, concentration, rate applied, and total amount used.
5. Purpose of application.

Such records shall be kept for a period of two years from the date of application of the pesticide and shall be available for inspection by the commissioner at reasonable times. The commissioner shall be furnished a copy of such records by the commercial applicator.

REGISTRATION

Amended FIFRA requires that all pesticides be registered and classified as either general or restricted use. This includes all pesticides used in and around homes, swimming pools, businesses, public buildings, and recreation areas, as well as those used in agriculture.

With an application for pesticide registration, a manufacturer must submit data to the Pesticide Division of EPA showing that the product, when used as directed:

- **!** Is effective against the pest listed on the label.
- **!** Won't injure man, animals or crops or damage the environment.
- **!** Won't result in illegal residues on feed and food.

This data is then carefully analyzed and evaluated by various scientific experts.

RESIDUE TOLERANCES

One extremely important part of pesticide usage is the potential for food contamination by excess amounts of pesticide residue.

The Pesticide Amendment to the Federal Food, Drug, and Cosmetic Act authorizes EPA (formally FDA) to establish a legal tolerance for each pesticide on each food. The tolerance is the maximum amount of residue of that pesticide allowed on the crop at the time it's harvested or offered for sale. To establish the tolerance level, EPA scientists study and analyze the manufacturer's data.

Permissible tolerance levels are established well below any level that possibly could cause harm. In most instances, it would require at least 100 times the amount of residue allowed to create any potential harm to people who consume the products.

STATE REGISTRATIONS

The Utah Department of Agriculture and Food is authorized, subject to the Utah (Administrative) Rulemaking Act, to:

- (1) Declare as a pest any form of plant or animal life (other than man and other than bacteria, viruses, and other micro-organisms on or in living man or other living animals) that is injurious to health or the environment;
- (2) Determine, in accordance with the regulations made known by the EPA under Section 25(c)(2) of FIFRA, whether pesticides registered for special local needs under the authority of Section 24C of FIFRA are highly toxic to man;
- (3) Determine, consistent with EPA regulations, which certain pesticides, or amounts of substances contained in these pesticides, are injurious to the environment;
- (4) Adopt a list of restricted-use pesticides for the state or designated areas within the state if it determines, upon substantial evidence presented at a public hearing and upon recommendation of the pesticide committee, that restricted use is necessary to prevent damage to property or the environment; or
- (5) Adopt any regulation (not inconsistent with federal regulations made known under FIFRA) deemed necessary to administer and enforce this chapter, including but not limited to, regulations relating to the sale, distribution, use and disposition of pesticides as deemed necessary to prevent damage and to protect the public health.

EXPERIMENTAL-USE PERMITS OR (UEP)

Amended FIFRA requires experimental-use permits for those wishing to accumulate the information necessary to register a pesticide not registered by EPA or to register a new use for a previously registered pesticide.

Most experimental-use permits are obtained by the person wishing to register the pesticide. In most instances, this is the company producing or formulating the pesticide. Experiment Station and Extension Service personnel who test unregistered pesticides generally do so on the experimental-use permit obtained by the pesticide manufacturer.

No experimental-use permit is required to test a substance or mixture of substances to determine its value for pesticidal purposes or to determine its toxicity or other properties if the user doesn't expect to receive any benefit from the pest control. In addition to laboratory and greenhouse trials, this also affects:

Land use -- where tests are conducted on a cumulative total of not more than ten acres, provided that any food or feed crop involved in or affected by such tests is destroyed or consumed by experimental animals, unless a tolerance or exemption from a tolerance has been established.

Aquatic use -- where tests are conducted on a total of not more than one surface-acre of water, provided the waters affected by such tests are not used for irrigation, drinking, water supplies, or body-contact recreation purposes. No tests may be conducted in any areas where fish, shellfish, or other plants and animals are taken for recreational or commercial purposes and used for food or feed, unless a tolerance or exemption from a tolerance has been established.

Animal treatments -- conducted only on experimental animals. No animals may be tested if they may be used

in food or feed, unless a tolerance or exemption from a tolerance has been established.

No experimental-use permit is needed for a substance or mixture of substances that under the Federal Food, Drug, and Cosmetic Act is defined as a "new drug," "new animal drug," or "animal feed."

THE EUP

The application for an experimental-use permit (EUP) is made on forms provided by EPA and should be made as far in advance of the intended date of use as possible. The Utah Department of Agriculture and Food requires notification by the manufactures as to time, place and the amount of EUP products used in Utah. No state EUP permit or registration is required, just notification.

The administrator of EPA issues the permit after he or she determines that the conditions and regulations of FIFRA have been and will be met.

Permits are effective for a specified time, normally one year. The quantity of pesticide allowed in the experimental program is specified and may be limited to certain states listed in the permit. If no temporary or permanent tolerance or exemption from a tolerance is granted, food or feed commodities must be destroyed after testing.

PUBLICATION

Any time an experimental-use permit is granted by EPA, a notice is printed in the Federal Register. EPA also may publish notice of an application for an experimental-use permit in the Federal Register prior to granting or denying the permit so that interested persons may comment.

LABELING EUP COMPOUNDS

Pesticides under an experimental-use permit may be distributed or sold only to participants in an experimental program.

All pesticides shipped or used under an experimental-use permit must be labeled with the directions and conditions for use set by the administrator of EPA. These labels and directions must include:

- All information prescribed for regular pesticide labels, except that a registration number and the previously registered use patterns won't appear.
- The registration number of the manufacturer or formulator.
- "For Experimental Use Only" prominently exposed.
- The experimental-use permit number.
- "Not for Resale."

DATA-REPORTING

The permit-holder shall supervise the test program and evaluate the results of testing from each site of application. He also must report any adverse effects from use of or exposure to the pesticide.

Most experimental-use permits are held by the company wishing to register the pesticide, so the company is responsible for reporting to EPA. If Extension Service and Experiment Station personnel or others are testing the experimental pesticide, they must provide reports to the company holding the permit. The kinds of information they report generally are determined in collaboration with the company before they conduct the test.

SPECIAL LOCAL NEEDS OR SECTION 24C

Section 24C of the amended FIFRA permits a state to register pesticides formulated for distribution within that state to meet special local needs. However, EPA must certify the state as capable of exercising adequate controls to assure that such registrations will be in accord with the purposes of FIFRA.

The purpose of state registrations is to cut the time, expense, and red tape involved in registering a pesticide for a special local use. The pesticide may be needed to treat a pest infestation that is a problem in that state but that isn't sufficiently widespread to warrant the expense and difficulties of federal registration.

When there's an existing or expected local minor pest problem, the state may register pesticides if:

- There's no EPA-registered pesticide for the use in question.

- There's an EPA-registered pesticide, but it isn't available or can't be obtained in a sufficient quantity.
- There's an EPA-registered pesticide that normally would be suitable when used according to label instructions but that won't be safe or effective under local conditions.

All states have some limitations in what they can register, however. They may not register the following:

- Pesticides containing active or inert ingredients not contained in any EPA-registered products.
- Any pesticide products or uses affected by suspension or cancellation action based on human health, environmental or efficacy considerations.
- Pesticide products and/or uses formerly denied registration by EPA.

EPA certification of a state won't necessarily be an all-or-nothing authorization. A state may be certified to issue one or more types of registration, depending on its scientific expertise, registration procedures, and legal authority.

Utah has been granted certification to register pesticide products for changed-use patterns (such as changing a ground application to an aerial application) or for added uses. The most recent information with regard to Utah's authorizations is available from the Utah Department of Agriculture and Food, Division of Plant Industry.

If the administrator of EPA disapproves a state registration, the disapproval can't remain effective for more than 90 days. If not disapproved, it becomes a federal registration (for that state only) and is then subject to EPA actions such as suspension and cancellation procedures.

Special local-need registrations may be sought by commodity groups, extension service personnel, and others. The pesticide manufacturer or formulator must, however, be willing to register or add the use in question to his product's label for use in the state. It's necessary for those making the request to work with the manufacturer or formulator in developing the necessary information to support the request for registration.

EMERGENCY USES OR SECTION 18

Amended FIFRA makes it illegal to use a pesticide for any unregistered purpose.

But there may be situations in which a registered pesticide isn't available for a certain use. For example, an outbreak of a previously minor pest may occur in a crop, and there may be no registered pesticide available for use on that crop for that pest.

Section 18 of amended FIFRA provides for emergency use of pesticides in such situations. A state may obtain permission to use an unregistered pesticide available to control the pest problem. FIFRA provides for three types of exemptions:

1. **Specific Exemption**

When a pest outbreak has occurred or is about to occur and there isn't a registered pesticide for that use or purpose, a request for an EPA exemption to use a certain pesticide to control it may be made by the state lead agency. In our state, this is the Utah Department of Agriculture and Food.

Information must be supplied, including the nature, scope and frequency of the problem; the pest involved; which pesticide or pesticides will be used and in what amounts; the economic benefits anticipated; and an analysis of possible adverse effects.

The specific exemption will be good only for a specified amount of time and for a designated area. Reports must be filed when the treatment is over.

2. **Quarantine or Public-Health Exemption**

This exemption may be granted to prevent the introduction or spread of a foreign pest into or throughout the United States or to prevent a public-health problem.

No pesticide that has been suspended by EPA may be used. The procedure for requesting this exemption is the same as that outlined above under Specific Exemption.

3. **Crisis Exemption**

A crisis exemption may be used if it's found that there's no readily available pesticide registered to control or

eradicate the pest and that there isn't time to request and get approval for a specific exemption.

No pesticide that has been suspended or canceled may be used.

The administrator of EPA must be notified by telephone within 36 hours of use. Within ten days of the use, the state must file information similar to that required for the specific exemption.

INTEGRATED PEST MANAGEMENT

The earliest use of the term "integrated pest management" (IPM) -- at least in the context of pest control -- dates back to 1954. It isn't a new idea. The concept received some attention even before World War II, and of course, farmers have always used cultural practices and natural forces to hold down harmful insects, diseases, weeds, and other pests. But the advent of DDT and other pesticides in the 1940s diverted attention away from non-chemical control measures.

These new chemical materials were easy to apply and, initially, so effective and inexpensive that they appeared to be the ultimate control tool. Because recognition of their shortcomings was slow to surface, the use of pesticides increased dramatically over the next three decades and came to be the primary control measure for pests of all kinds. Pesticides are important tools used to protect our food supply -- for seed and soil treatment, pre- and post-emergence weed control, protection of plants and animals, post-harvest protection, and public health.

As a basic component of agricultural technology, these materials have played -- and will play -- an essential role in food and fiber production. But the inherent drawbacks of dependence on this single line of defense have become increasingly apparent. It has introduced problems of pesticide resistance, destruction of natural controls, outbreaks of secondary pests, reduction of pollinators and other beneficial species, potential environmental contamination, and some health hazards.

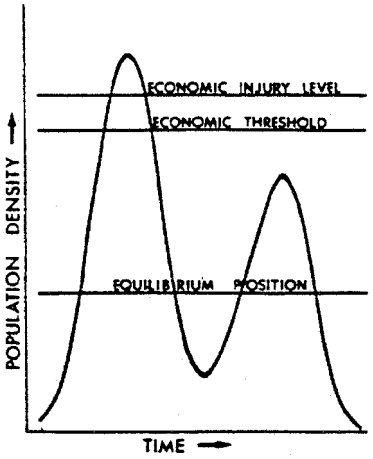
The unilateral use of any control measure -- even the introduction of an insect-resistant plant variety -- can have unexpected and undesirable consequences. Integrated pest management is designed to reduce the control failures associated with pest resistance, resurgence, and secondary
outbreaks increasingly generated by sole dependence on pesticide use. It's a flexible, multidimensional approach using a range of biological, cultural, mechanical and chemical techniques as required to hold pests below damaging economic levels without significantly disrupting the ecosystem. The basic premise is that no single arbitrary control method will be successful because of the remarkable adaptive powers of insects, weeds, and plant pathogens and because of the many variables related to location, season, cropping patterns, and individual pests.

The key ingredient of integrated pest management is information. We must know the dynamics of pest populations and be able to predict the pest's occurrence, its population levels, and the potential economic damage. We must know the biology of the pest organism, its natural enemies, the host plant or animal, and their interrelationships in the environment.

We must be able to forecast the effects of various control techniques and strategies on each other and on the environment in which they are used. We must know more about the effects on pests of weather conditions, crop status, and cultural practices such as irrigation, cover-crop management, and harvesting methods.

Systems analysis -- the child of mathematics, engineering and the computer age -- has proven valuable to researchers in developing models. The computer and the evolving science of ecosystem analysis are well suited to such complex problems.

It has been well established by numerous research scientists that well-designed IPM models are of immense value in helping researchers organize their facts, find conceptual and actual data gaps, interpret pest- management problems, and apply the conclusions to field situations.



The pest-population level at which controls are employed to prevent the population from exceeding the economic injury level is the ECONOMIC THRESHOLD.

Some crop-protection specialists continue to discredit the IPM concept as representing only new jargon applied to long-established crop-protection practices. It's acknowledged that IPM isn't a separate development in crop and health protection; it is an evolutionary stage in pest-control strategy that represents some new conceptual approaches that set crop protection in a new context within a crop-production system.

Our state of technology and understanding of host-pest interactions has evolved to the point that an integration of pest-control tactics for multiple classes of pests isn't only feasible but necessary, given the inadequacies of single-method, single-discipline approaches and their potential for undesirable environmental and legal effects. Research-and-development personnel should incorporate applicable parts of IPM into the information-transfer phase of their findings to the end-user group(s).

PESTICIDE-USE LIABILITY

Be aware that liability may be incurred. Follow all label directions.

Penalties -- Both civil and criminal penalties can be assessed for FIFRA violations.

Unlawful Acts -- A variety of actions by pesticide manufacturers, sellers and users are unlawful under provisions of FIFRA. These acts include (in part):

1. Distributing, selling or delivering any unregistered pesticide.
2. Making any advertising claim about a pesticide not included in the registration statement.
3. Selling any registered pesticide if its actual content doesn't conform with label data.
4. Selling any pesticide not colored according to its registration specifications.
5. Selling an adulterated or misbranded pesticide.
6. Detaching, altering, defacing or destroying any part of a container label.
7. Refusing to keep records or to permit authorized EPA inspections.
8. Making a guarantee other than specified by the label.
9. Advertising a restricted-use pesticide without giving the product classification.
10. Making a restricted-use pesticide available to a non-certified applicator (except as provided by law).
11. Using a pesticide in any manner not consistent with the label.

CIVIL PENALTIES

In general, commercial applicators, wholesalers, dealers and retailers "may be assessed a civil penalty . . . of not more than $5,000 for each offense."

The first violation by a private applicator results in a warning from EPA; each subsequent offense is subject to a fine of "not more than $1,000."

Violations related to applications of general-use pesticides can result in fines of "not more than $500 for the first offense nor more than $1,000 for each subsequent offense."

In determining civil penalties, Sec. 14(1)(4) requires EPA to consider: a) size of the business, b) how the penalty will affect the ability of the firm to remain in business, and c) gravity of the violation. In cases involving only minor violations, EPA may issue a warning instead of assessing a penalty.

CRIMINAL PENALTIES

Willful violation of FIFRA provisions is a misdemeanor. Upon conviction, a private applicator is subject to a fine of up to $1,000 and/or 30 days' imprisonment; a

commercial applicator is subject to a fine of not more than $25,000 and/ or up to one year of imprisonment.

OTHER REGULATIONS

Transportation

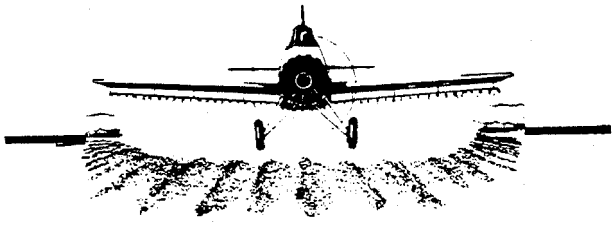
Shipment of pesticides and other dangerous substances across state lines is regulated by the federal Department of Transportation (DOT). DOT issues the rules for hauling these materials. DOT standards tell you which pesticides are dangerous to man and therefore create a health hazard during transportation.

If you ever haul pesticides between states, you should know that:

- ! They must be in their original packages. Each package must meet DOT standards.
- ! The vehicle must have a correct sign. Manufacturers must put the correct warning signs on each package.
- ! The pesticides may not be hauled in the same vehicle with food products.
- ! You must contact DOT immediately after each accident:
  a) when someone is killed,
  b) when someone is injured badly enough to go to a hospital, or
  c) when damage is more than $50,000.
- ! You must tell DOT about all spills during shipment. State and local laws may require you to take additional precautions while transporting pesticide products.

Aerial Application

Application of pesticides from airplanes is regulated by the Federal Aviation Administration (FAA), EPA, and also by the state. FAA judges both the flying ability of pilots and the safety of their aircraft. FAA rules, too, say that an aerial applicator may not apply any pesticide except as the label directs.



Workers' Safety

The Occupational Safety and Health Act of 1970 is administered by the Occupational Safety and Health Administration (OSHA) in the U.S. Department of Labor. It requires anyone with 11 or more workers to keep records and make reports. The records must include all work-related deaths, injuries, and illnesses. Minor injuries needing only first-aid treatment need not be recorded. A record must be made if the injury involves:

- ! Medical treatment.
- ! Loss of consciousness.
- ! Restriction of work or motion.
- ! Transfer to another job.

This law also requires investigation of employee complaints that may be related to pesticide use, re-entry or accidents.

SPECIAL HAZARDS AND PRECAUTIONS

Pesticides are poisons that kill. They should be stored, handled and applied with respect for their dangerous nature. Restricted-use pesticides deserve special respect, for often they have been singled out because they are a particular hazard to man or the environment. Extra precautions are required in experimental programs, because one is using compounds that don't have long histories of use. One must be sure that label precautions are understood and can be followed before using any pesticide. This may mean checking with the manufacturer of an experimental compound or a restricted-use compound with an experimental label if there isn't enough information provided about cautions and toxicity.

HUMAN TOXICITY

Toxicity values are a guide to the toxic effects of chemicals on humans or other animals. But they aren't the only hazardous factor associated with exposure to chemicals. A compound may be extremely toxic but present very little hazard due to dilution, low volatility, or safe use. A chemical with low toxicity may be hazardous due to concentration, high volatility, or careless use. Generally, insecticides and rodenticides are most toxic to humans when they have the smallest LD50 figures. Most herbicides and fungicides have larger acute oral LD50's (are less toxic) when compared to many insecticides and rodenticides, but even they can cause injury if not properly used.

PERSISTENT PESTICIDES

Persistence of herbicides in soil is an essential feature of pre-emergence weed control. But a major hazard arising from herbicide persistence in soils is phytotoxic residues that injure sensitive succeeding crops.

Personnel establishing research and/or demonstration plots should carefully explain to the farmer and/or owner of the land the required waiting period for planting different crops following application of planned pesticide treatments. Private, county, or other non-university land should receive only those herbicide treatments that won't injure succeeding crops or vegetation in the normal cropping sequence.

Other pesticides, such as soil insecticides, can persist as pollutants in the soil, in streams, and in the bodies of animals long after they have been applied. This is a hazard not so much to succeeding crops as to non-target organisms and humans, especially if the pesticide residues move away from the site of application.

Researchers should be aware of the possible carryover effects of active levels of persistent pesticides and also how these pesticides can influence a later year's data collection on a site.

COMPATIBILITY AND EFFICACY OF PESTICIDE MIXTURES

It is often desirable to combine chemicals designed for different purposes or pests and apply them together in a single spray application. Often a wider variety of pest species may be controlled by using the pesticides in combination than if they are used separately. Multiple combinations of fungicides, insecticides, miticides, herbicides, growth regulators, liquid nutrients and such are used many times to save time and labor. Because the rate of each pesticide usually is reduced in the combination, soil residue and crop injury may be reduced.

This shortcut may be profitable or disastrous, depending on the compatibility of the materials mixed.

When pesticides are used in combination without impairing the efficiency of the component chemicals or resulting in injury to the plants to which they are applied, the combination is "compatible." If the combination results in reduced efficiency, causes plant damage, or has undesirable physical properties, the mixture is "incompatible."

Chemical incompatibility is the breakdown or loss in effectiveness of one or all of the components. The mixture may not be as effective in controlling unwanted pests or may cause injury to plants (phytotoxicity). For example, many organic pesticides break down when used with alkaline materials (lime, lime-sulphur, and Bordeaux mixture).

Physical incompatibility occurs when the mixture becomes unstable. It results in the formation of a heavy precipitate or buttery mass, excess foaming, or poor distribution of the pesticide. Often this incompatibility causes settling out of the chemicals in the spray tank and leads to clogging of sprayer nozzles and screens.

Some pesticides have been formulated in combination and are available as a package mix. Others may be applied as a tank mix if such directions are on their labels, but one must follow all use limitations on the label of each product used in the combination. Experimental compounds, on the other hand, shouldn't be tank-mixed unless one has received specific information from the cooperating company indicating that such a mix already has been tested and proven compatible.

EFFECTS ON NON-TARGET ORGANISMS

From an ecological standpoint, there's no "good time" or "right place" to introduce toxic compounds into the environment. It's nearly impossible to imagine using

pesticides without causing some negative environmental impact. Since restricted-use pesticides often are known for their hazardous effects on non-target organisms and the environment, and since we know little about what the harmful side-effects of experimental compounds might be, these pesticides deserve extra precautionary measures.

Contamination of even a short section of a stream or drainage ditch may poison animals or fish for many miles downstream. But some pesticides are much less toxic to fish than others, and careful selection and use of pesticides may eliminate some of the hazards to fish and wildlife.

Honeybees are another environmental concern one needs to be aware of constantly. Bees are valuable as honey producers and pollinators, but they also are insects susceptible to many of the insecticides used to kill insect pests. (Fungicides, acaricides/miticides, herbicides, and blossom thinners are relatively non-toxic to bees.) Some insecticides will kill bees on contact during application and for one or more days after treatment.

Some points to remember with regard to the hazards associated with honeybees are the following:

- Prevention of bee losses is a joint responsibility of the spray operator, the farmer, and the beekeeper. Bees should be moved from the area if highly toxic materials are to be used on plants the bees are visiting. Before spraying is done, the beekeeper should be notified in ample time to allow him to arrange for protection or movement of his colonies.
- Sprays generally are less hazardous to bees than dusts, emulsifiable concentrates are less toxic than wettable powders, and granular materials seldom are used in a way that would harm bees.
- Late-evening and early-morning applications will reduce bee kill.
- Ground-sprayer treatments usually are less severe on bees than are aircraft applications.
- Spraying or dusting while bees are active in the fields will increase bee kill.
- Treatment over hives when bees are clustered outside them during hot weather increases bee kill.
- Drift to neighboring fields in blossom or to adjacent blossoming weeds and wildflowers may result in substantial bee poisoning.

Herbicides present a special kind of hazard for non-target plant organisms. Gardens, desirable trees and plants, and crops are needlessly damaged each year as a result of drift and/or fumes from improper application of foliage-applied herbicides.

Foliage-applied herbicides that have damaged desirable plants include dicamba (Banvel) and phenoxy herbicides such as 2,4-D and 2,4,5-T, but newer experimental herbicides also may present such a hazard.

To reduce drift and fumes from volatile herbicides:

- Apply chemicals when wind is calm or when a light breeze is blowing away from non-target plants. Spray drift from 2,4-D can injure susceptible plants more than six or seven miles away.
- Use low pressure (20 to 30 pounds per square inch).
- Use 15 to 20 gallons of spray per acre for ground applications.
- Apply herbicide spray as close to target plants as possible.
- Use drift-control agents, if necessary, to avoid damage to nearby plants.
- With phenoxy herbicides, use amine-salt formulations if possible and if temperatures are expected to exceed 80 degrees F. If ester formulations must be used, apply low-volatile ester formulations when air temperatures are expected to stay below 85 degrees F. for several hours. High-volatile ester formulations of 2,4-D and 2,4,5-T release vapors or fumes rapidly at about 80 degrees F., low-volatile ester formulations at about 90 degrees F.

Non-target soil areas also quite often are contaminated as a result of improper use of herbicides. Water and/or soil movement of soil herbicides can injure or kill

desirable vegetation down-slope. To prevent such damage:

- ! Don't apply the herbicide on sloping land if desirable non-target plants are down-slope.
- ! Apply soil-applied herbicides only where roots of desirable trees don't penetrate the treatment area.

CROPS TREATED WITH EXPERIMENTAL COMPOUNDS

Crops treated with experimental compounds may not be sold for consumption unless at least a temporary tolerance has been established for the crop-pesticide combination. Once all data has been collected, the crop must be harvested and destroyed, usually either by burning or by burial in a designated site.

Co-workers, family, friends and such must not be allowed to take samples from the experimental plots for personal consumption. Again, this is primarily a matter of not knowing enough about experimental compounds to warrant exposing someone to any potential hazards associated with them

DISPOSAL OF UNUSED EXPERIMENTAL COMPOUNDS

All experimental chemicals should be kept separate and clearly labeled until disposal. Mixing them may save space but creates both immediate hazards and possible disposal problems.

The best way to dispose of unused experimental chemicals is to return them to the manufacturer or formulator. In fact, when agreeing to cooperate in a research project using such chemicals, one should try to get an agreement from the manufacturer to take back all unused portions.

Some chemicals can be disposed of by incineration, if an incinerator is available that reaches adequately high temperature. For other chemicals, there may be a means of neutralization. Burial of unused pesticides in an impermeable site is the last resort, and detailed records about what was buried, how much, and when should be kept.

HAZARDOUS-WASTE DISPOSAL

Hazardous-waste disposal is no longer a problem just for big companies. The latest version of the Resource Conservation and Recovery Act (fall of 1984) brings the problem closer to home. Now among those covered by the law are companies or agents that produce as little as 220 pounds of hazardous waste materials a month; that amount is equal to about 28 gallons of water.

Requirements for smaller producers begin with record-keeping -- logging what happens to the waste -- but then go on to include more stringent provisions. If you have dumped such waste, you could be forced to pay the entire cost of cleaning up the dump site, regardless of how little you contributed to the problem.

- ! If the disposal was illegal, penalties can range up to a million dollars for a corporation and a quarter of a million dollars for an individual.
- ! If the disposal company you hired to get rid of your waste goes bankrupt, responsibility for cleaning up any dump sites it may have abandoned could fall to you and the other customers.
- ! The costs of cleaning up sites where the dumpers can't be identified will be met out of a public fund to be financed by fees charged future waste-disposers.

PESTICIDE-CONTAINER DISPOSAL

Empty pesticide containers should be cleaned as suggested in the general manual.

They should be destroyed by crushing and deep burial where the water supply won't be contaminated or by burning. But if containers are burned, the smoke can be dangerous. Empty containers from 2,4-D and other growth-regulating materials shouldn't be burned.

As with unused pesticides, if the containers are from experimental chemicals, an effort should be made to have the manufacturer take them back

Triple-Rinsing

1. Empty container into spray tank; drain in vertical position 30 seconds.
2. Refill container with clean water until 10 percent full; rinse thoroughly; pour into tank.

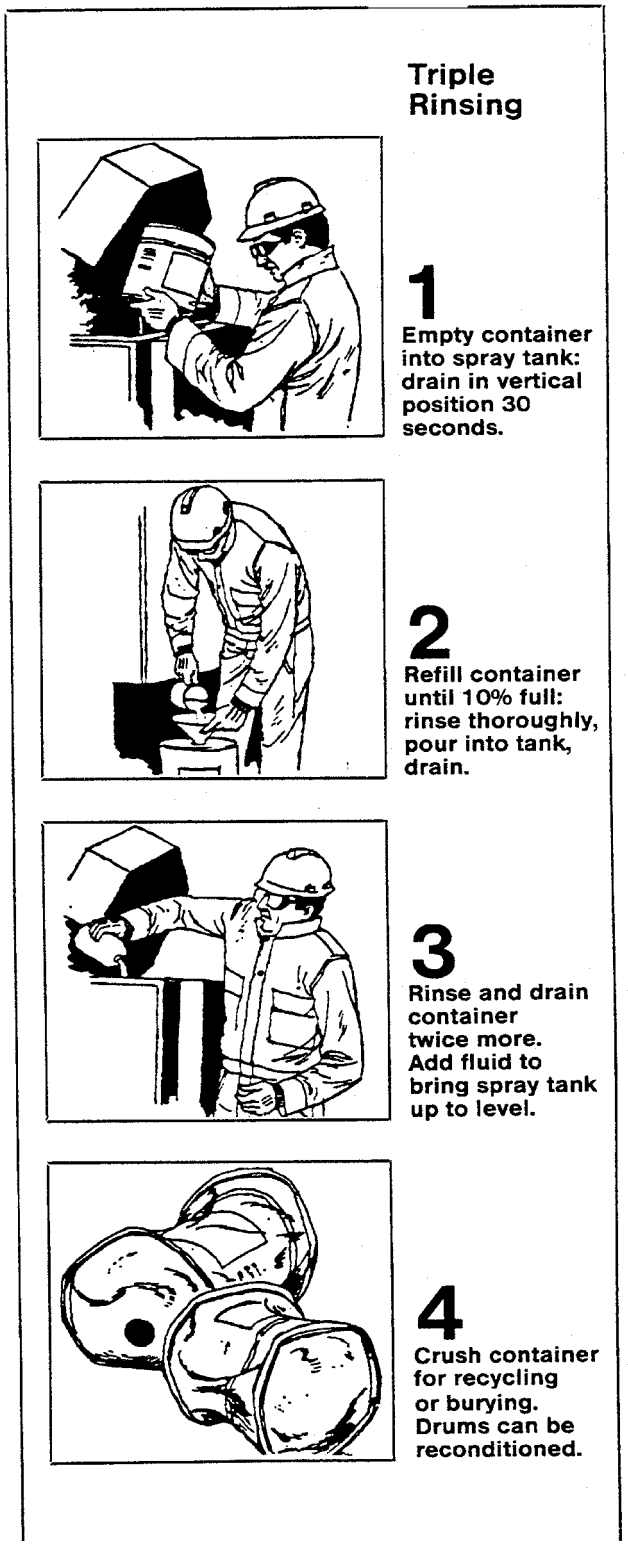
3. Rinse and drain container twice more. Add fluid to bring spray tank up to correct level.
4. Crush container for recycling or burying. Drums can be re-used.

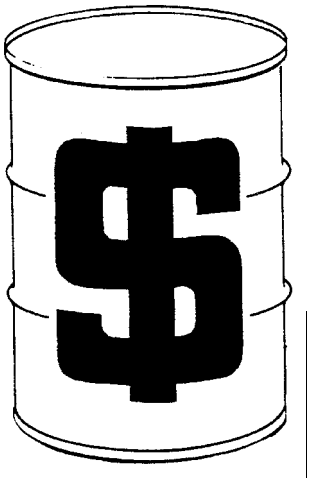
PESTICIDE SAFETY

You should be aware that using experimental pesticide compounds poses a potentially serious problem -- a poisoning with a pesticide product with which your doctor is unfamiliar.

It is advisable, prior to use, to call the Rocky Mountain Poison Center (1-800-456-7707 or 801-581-2151) for information or recommended treatment.

You are encouraged to carefully review the section on pesticide storing, handling and mixing in the *Applying Pesticides Correctly Study Guide*.





PESTICIDE RECOMMENDATION AND BUSINESS SENSE

Researchers working with experimental pesticide products should keep in mind that looking at the efficacy of the product alone may come up short.

Considering the high costs of producing a crop, it's very important to carefully analyze the actual dollar value any input adds per unit of commodity produced. Highest yield may not necessarily be the most economical if you have also had a high cost per unit of production.

The cost-benefit analysis should achieve the lowest cost per unit produced -- the maximum economic yield or the greatest net return on investment.

CATEGORIES OF ACUTE TOXICITY

Categories	Signal Word Required on the Label	Oral	LD_{50} Dermal mg/kg	LC_{50} Inhalation mg/l	Probable oral Lethal Dose for 150 lb. man
I Highly Toxic	DANGER—skull and crossbones POISON	0—50	0—200	0—2,000	A few drops to a teaspoonful.
II Moderately Toxic	WARNING	over 50 to 500	over 200 to 2,000	over 2,000 to 20,000	Over one teaspoonful to one ounce.
III Slightly Toxic	CAUTION	over 500	over to 20,000		Over one oz. to one pint or one pound.
IV Relatively Non-toxic	CAUTION	over 5,000	over 20,000	———	Over one pint or one pound

THREATENED AND ENDANGERED SPECIES

The Endangered Species Act (ESA) was passed by Congress to protect certain plants and wildlife that are in danger of becoming extinct. This act requires EPA to ensure that these species are protected from pesticides.

Formulation of the Utah Threatened and Endangered Species/Pesticides Plan is a cooperative effort between federal, state, and private agencies and producers/user groups, and is a basis for continuing future efforts to protect threatened and endangered species from pesticides whenever possible. Furthermore, this plan provides agencies direction for management policies, regulations, enforcement and implementation of threatened and endangered species/pesticide strategies.

EPA has therefore launched a major new initiative known as the Endangered Species Labeling Project. The aim is to remove or reduce the threat to threatened and endangered species from pesticide poisoning. EPA has the responsibility to protect wildlife and the environment against hazards posed by pesticides. The ESA is administered by the U.S. Fish and Wildlife Service (FWS) in the U.S. Department of Interior. The Fish and Wildlife Service will determine jeopardy to threatened and endangered species and report to EPA. EPA and FWS will work cooperatively to ensure that there's consistency in their responses to pesticide users and to provide necessary information. The Utah Department of Agriculture and Food is acting under the direction and authority of EPA to carry out the ESA as it relates to the use of pesticides in Utah.

Maps will show the boundaries of all threatened and endangered species habitats in affected counties. The maps identify exactly where, in listed counties, use of active ingredients in certain pesticides is limited or prohibited. Product labels will be updated as necessary. The updated labels will reflect any additions or deletions to the project. Because EPA's approach to the protection of threatened and endangered species was in the proposal phase at the time this guide was published, any and all of the above information on threatened and endangered species is subject to change and may not be valid.

WORKER PROTECTION STANDARDS

This final rule, which was proposed in 1988 and that substantially revised standards first established in 1974, affects 3.9 million people whose jobs involve exposure to agricultural pesticides used on plants; people employed on the nation's farms; and in forests, nurseries and greenhouses. The standard reduces pesticide risks to agricultural workers and pesticide handlers. The standard is enforceable on all pesticides with the Worker Protection Standard labeling. The provisions became fully enforceable in January 1995.

Agricultural workers in Utah now have a far greater opportunity to protect themselves, their families and others. These workers will know, often for the first time, when they are working in the presence of toxic pesticides, understand the nature of the risks these chemicals present, and get basic safety instructions.

Among the provisions of the rule are requirements that employers provide handlers and workers with ample water, soap and towels for washing and decontamination and that emergency transportation be made available in the event of a pesticide poisoning or injury. The rule also establishes restricted-entry intervals -- specific time periods when worker entry is restricted following pesticide application -- and requires personal protection equipment (PPE) for all pesticides used on farms or in forests, greenhouses and nurseries. Some pesticide products already carry restricted re-entry intervals and personal protection equipment requirements; this rule raised the level of protection and requirements for all products.

Other major provisions require that employers inform workers and handlers about pesticide hazards through safety training, which handlers have easy access to pesticide-label safety information, and that a listing of pesticide treatments is centrally located at the agricultural facility. Finally, handlers are prohibited from applying a pesticide in a way that could expose workers or other people.

GROUNDWATER CONTAMINATION BY PESTICIDES

Utah has implemented a comprehensive and coordinated approach to protect groundwater from pesticide contamination.

Formulation of the Groundwater/Pesticide State Management Plan is a cooperative effort between federal, state, and private agencies and producers/user groups; it provides a basis for continuing future efforts to protect groundwater from contamination whenever possible. Furthermore, this plan provides agencies with direction for management policies, regulations, enforcement and implementation of groundwater strategies.

While it's recognized that the responsible and wise use of pesticides can have a positive economic impact, yield a higher quality of crops, enhance outdoor activities, and give relief from annoying pests, the Utah Department of Agriculture and Food is authorized by the U.S. Environmental Protection Agency (EPA) to enforce the protection of groundwater from pesticides. Product labels will be updated as necessary.

The Utah Department of Agriculture and Food, in concert with cooperating agencies and entities, admonishes strict compliance with all pesticide labels, handling procedures and usage to protect groundwater in the state.

Groundwater can be affected by what we do to our land. Prevention of groundwater contamination is important, because once the water is polluted, it's very hard and costly to clean up. In some instances, it's impossible, especially if it's deep underground. City and urban areas especially contribute to pollution because water runoff that contains pesticides runs into drainage tunnels, then into a river or an underground stream that drains into the river. For more complete information about what groundwater is and where it comes from, read the study manual "Applying Pesticides Correctly." Shallow aquifers or water tables are more susceptible to contamination than deeper aquifers. Sandy soils allow more pollution than clay or organic soils, because clays and organic matter absorb many of the contaminants.

The Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), as amended, establishes a policy for determining the acceptability of a pesticide use or the continuation of that use, according to a risk/benefit assessment. As long as benefits outweigh adverse effects, a pesticide can be registered by the EPA. Although the intent of a pesticide application is to apply the pesticide to the target or pest, part of the pesticide will fall on the area around the target or pest. Rain or irrigation water then can pick up the part that isn't degraded or broken down and carry it to the groundwater via leaching.

The major factors that influence the amount of contamination that can get into water are the chemicals' persistence in soil, retention time or time it remains in the soil, the soil type, the time and frequency of the application(s), soil moisture, placement of the pesticide, and the ability of the chemical to persist once in the aquatic environment. Each of these factors will influence the amount of pesticide that can leave the root zone or soil surface and percolate to groundwater.

Although some pesticides may have a high absorption quality, when they are applied to sandy soil, they will still migrate to the water table because there are no fine clay particles or organic matter to hold them. The management and use of pesticides is up to the individual applicator and/or land owner as to whether safe practices are used. Water is one of our most valuable resources; we must keep it as pure as possible.